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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 09/955,297
Filing Date: September 19, 2001
Appellant(s): ROHR ET AL.

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Stanley Spooner
For Appellant

SUPPLEMENTAL EXAMINER'S ANSWER

This is in response to the supplemental reply appeal brief filed October 7, 2005 appealing from the Office action mailed January 21, 2004.

(10) Response to Argument

The Appellant states that "[i]n view of the Examiner's failure to completely respond to the Board's Remand requirements, Appellant requests that the present appeal be maintained (pursuant to 37 CFR 41.50(a)(2)(ii)) and that the issues be promptly considered by the Board and a decision based thereon forwarded to the Appellant." However, it should be noted that it is the Examiner's position that the Supplemental Examiner's Answer dated August 9, 2005 completely responds to the Board's Remand requirements.

1. *The Examiner provides a complete explanation of why the arguments in the Reply Brief (dated November 22, 2004) are not convincing.*

Appellant argues that the Examiner raises a new issue by suggesting that the cited prior art reference Ekins-Daukes et al inherently contains the instant requirement of "substantially no shear force". Appellant argues that "[s]ince this issue has never been raised before in any rejection, no opportunity has been provided during prosecution for Appellant to require the Examiner to support his position." Appellant states that a further remand to the Examiner for support of inherency is not needed "as the Board mandated that the Examiner in the Supplemental Examiner's Answer, provide a 'complete explanation' and the failure to provide any support for the 'inherency' position is an admission that there is no support." Appellant argues that "the Examiner's failure to meet his duty to provide evidentiary support, if any, for his 'inherency' theory in the Supplemental Examiner's Answer, means that no remand is needed". Appellant's arguments are not deemed to be persuasive because the Examiner has not raised a

new issue. Rather, the Examiner provided further rationale in support of the rejection based on Ekins-Daukes et al. For example, at page 3, lines 8-10, of the final rejection mailed 01/21/2004 the Examiner stated that "[s]ince the strain is zero over each period [i.e., the period of a compressively stained InGaAs quantum well/tensile strained GaAsP barrier], each period exhibits zero shear force on neighboring structures, which includes a further period or the substrate." In the Supplemental Examiner's Answer of 08/09/2005, the Examiner provides further rationale by showing that there is very little difference between the lattice constant for the GaAs substrate and for the actual InGaAs and GaAsP materials used by Ekins-Daukes et al, i.e., the lattice constants for the $In_{0.17}Ga_{0.83}As$ and $GaAs_{0.939}P_{0.061}$. Since there is very little difference in lattice constants, there is going to be "substantially no shear force" on neighboring structures, as here claimed.

2. *Response to Appellant's rebuttal to Examiner's comments on strain is not the same as stress.*

Appellant argues that the Examiner's statement that "Appellant has not shown there would be a substantial difference in Hooke's law constant for the GaAs, $GaAs_{0.939}P_{0.061}$ barrier and $In_{0.17}Ga_{0.83}As$ well so that there would be substantial shear force" is a completely new allegation by the examiner and should not be the basis for a rejection, and Appellant argues that "the Examiner's admission that 'stain is not the same as stress' should be taken as fact in view of the submission." However, this argument is not deemed to be persuasive. The Examiner agrees with Appellant that if two materials have different Hooke's Law constants k, i.e., k_1 and k_2 and if those

materials are strained the same amount due to a difference in Hooke's law constant, the resultant stress will be different (see Appellant's argument in the paragraph bridging pages 2 and 3 of the Reply Brief filed 11/22/2004). The Examiner's statement that "Appellant has not shown there would be a substantial difference in Hooke's law constant for the GaAs, $GaAs_{0.939}P_{0.061}$ barrier and $In_{0.17}Ga_{0.83}As$ well so that there would be substantial shear force" is further rational to further support the Examiner's position and rebut Appellant's argument.

Appellant argues the following:

> "it is known that alternating barriers and wells have bigger and smaller lattice constants. This is known both from Appellant's specification, page 3, lines 4-7 and from reviewing the cited EDI [Ekins-Daukes et al]. Three lines from the bottom of the first column on page 4195 of EDI [Ekins-Daukes et al] states 'a_{InGaAs}' and 'a_{GaAsP}' are the respective well and barrier lattice constants. As is well known to those of ordinary skill in the art, if the lattice constants were the same, there would be no need for these terms in cited 'equation (1).'"

This argument is not deemed to be persuasive because Appellant has not focused in on the particular materials used by Ekins-Daukes et al, i.e., the GaAs, $GaAs_{0.939}P_{0.061}$ and $In_{0.17}Ga_{0.83}As$. Appellant has not shown there would be a substantial difference in Hooke's law constant for the GaAs, $GaAs_{0.939}P_{0.061}$ barrier and $In_{0.17}Ga_{0.83}As$ well so that there would be substantial shear force. In other words, if it is the Appellant's position that the lattice constants of Ekins-Daukes et al GaAs, $GaAs_{0.939}P_{0.061}$ barrier and $In_{0.17}Ga_{0.83}As$ are different, then Appellant should show that such a difference in lattice constants will not permit the claimed limitation of "substantially no shear force" to be met.

Appellant argues that "the Examiner has adduced no evidence of record tending to establish that the barrier and well would have the same lattice constants (as apparently contended by the Examiner) and the Appellants specification and the cited EDI [Ekins-Daukes et al] reference both teach that the lattice constants of barriers and wells are different." Appellant argues that "any difference in the lattice-constants of the well and barrier is sufficient to cause a net difference in shear force" and that "[w]hile the net shear force of one barrier/well combination of layers may be small, as the number of layers increases, the net shear force increases as well." Appellant argues that "[a]s a result, as increasing net shear force (caused by a given shear force for a single barrier/well combination which then increases as the number of barrier/well layers are increased will result in dislocations" and that "[a]s dislocations reduce the efficiency of the MQW cell, such dislocations are to be avoided if possible." Appellant argues that the MQW in Ekins-Daukes et al did not provide even the measured efficiency of the GaAs control cell with which it was compared. However, these arguments are not deemed to be persuasive. Appellant's arguments concerning different lattice constants causing a net difference in shear force are not persuasive because Appellant has not addressed the particular materials used by Ekins-Daukes et al, i.e., the GaAs, $GaAs_{0.939}P_{0.061}$ and $In_{0.17}Ga_{0.83}As$. The Examiner has addressed these particular materials and their lattice constants. In particular, as noted by the Examiner on pages 3-4 of the Supplemental Examiner's Answer,

> "from instant Figure 7 it is seen that GaAs has a lattice constant of about 5.65 angstroms. The $GaAs_{0.939}P_{0.061}$ will be on the line between the GaP and GaAs data points in said Figure 7, and indeed, will be very close to but to the left of said GaAs data point and on said line. Likewise, the $In_{0.17}Ga_{0.83}As$ will

> be on the line between the InAs and GaAs data points in said Figure 7, and indeed, will be close to but to the right of said GaAs data point and on the line between the InAs and GaAs. In other words, there will be very little difference between the lattice constants for the GaAs, $GaAs_{0.939}P_{0.061}$, and $In_{0.17}Ga_{0.83}As$. The same can be said for the strain compensated quantum well in instant Table I, where InP is the substrate, the barrier is $In_{0.45}Ga_{0.55}As$ and $In_{0.47}Ga_{0.53}As$, and the well is $In_{0.62}Ga_{0.38}As$. The $In_{0.45}Ga_{0.55}As$, $In_{0.47}Ga_{0.53}As$, and $In_{0.62}Ga_{0.38}As$ have lattice constants very close to the $In_{0.53}Ga_{0.47}As$ seen at the arrow in said Figure 7, and said $In_{0.53}Ga_{0.47}As$ has the same lattice constant as InP. Accordingly, it is the Examiner's position that Ekins-Daukes et al's multiquantum well $GaAs_{0.939}P_{0.061}$ and $In_{0.17}Ga_{0.83}As$ on GaAs substrate inherently has zero-stress condition or substantially zero stress, and thus, there will be substantially no shear force as here claimed. Indeed, according to the instant specification, in order for there to be no shear force, the equation for zero stress condition is $\epsilon_1 t_1 A_1 a_2 + \epsilon_2 t_2 A_2 a_1 = 0$, wherein $\epsilon_i = (a_0 - a_i)/a_i$ and a_0 is the lattice constant of the substrate and a_i is the natural unstrained lattice constant of layer i (see pages 11 and 12). For Ekins-Daukes et al's $GaAs_{0.939}P_{0.061}$ barrier and $In_{0.17}Ga_{0.83}As$ well with GaAs substrate, the lattice constant a_0 for the GaAs substrate is very close to the lattice constant a_1 and a_2 for the $GaAs_{0.939}P_{0.061}$ barrier and $In_{0.17}Ga_{0.83}As$ quantum well, and thus, ϵ_1 and ϵ_2 are very close to or essentially zero."

Appellant has not provided any evidence that the solar cell prepared by Ekins-Daukes et al, i.e. prepared with GaAs, $GaAs_{0.939}P_{0.061}$ and $In_{0.17}Ga_{0.83}As$, would not provide the instant requirement of "substantially no shear force". Furthermore, with respect to Appellant's argument of a reduced conversion efficiency, Ekins-Daukes et al teaches that its MQW "equals a good GaAs cell in terms of power conversion efficiency" (see the abstract; and the results in Tables I and II at pages where the efficiency of the strain balanced cell differ only very slightly from the GaAs cell).

Appellant argues that Dr. Anderson found that using a strain-balanced approach in Ekins-Daukes et al was "insufficiently exact" to achieve zero stress and thereby prevent the efficiency robbing dislocations" and that "Appellant found that the zero-

stress system of the present invention permits a much larger numbers of layers (thereby increasing efficiency) with substantially no shear force, thereby preventing dislocations which limited MQW cell efficiencies." Appellant's argument is not deemed to be persuasive because the argument does not address the particular solar cell and materials used by Ekins-Daukes et al. Dr Anderson's statement concerning "insufficiently exact" is in paragraph 12 of Dr. Anderson's Rule 1.132 Declaration filed 07/22/03. As noted in the sentence bridging pages 5 and 6 of the Supplemental Examiner's Answer (08/09/2005), said "paragraph 12 does not address the exact solar cell prepared in Ekins-Daukes et al, i.e., the multiquantum well $GaAs_{0.939}P_{0.061}$ and $In_{0.17}Ga_{0.83}As$ on GaAs substrate. Furthermore, as noted in paragraph 18 on page 24 of the final rejection mailed 01/21/2004, said "Declaration does not provide actual evidence regarding differences in structure; Dr. Anderson's statements, while respectfully considered, constitute allegations and opinions that do not distinguish the structure of the claimed device from the prior art." It should be noted that Appellant argued in second paragraph on page 24 of the response dated 07/22/2003, that "Dr. Anderson testifies that the methods taught in Ekins-Daukes I [i.e., Ekins-Daukes et al] are 'insufficiently exact to ensure periods which exert 'substantially no shear force on a neighboring structure'". In the Final Rejection dated 01/21/2004 (at pages 22-23), the Examiner does not deem this to be persuasive because Appellant is not claiming a method for making a photovoltaic device, they are claiming the photovoltaic device. While the method to produce the claimed photovoltaic device may be different than the method used by Ekins-Daukes et al, any difference is irrelevant because the instant

claims are apparatus claims, and Ekins-Daukes et al teaches the same apparatus. "If … [Appellant] believes the method used to fabricate the photovoltaic devices is an improvement over the methods used by Ekins-Daukes et al, as suggested by Dr. Anderson's allegation that the Ekins-Daukes I [i.e., Ekins-Daukes et al] method is 'insufficiently exact', then … [Appellant] should consider the submission of method claims, as opposed to apparatus claims" (see page 23, lines 12-17 of said Final Rejection mailed 01/21/2004). Furthermore, a "reference that discloses a device having the same structure as the structure of the claimed device is not required to provide the same method of fabricating the device" (see page 23, lines 17-19 of the Final Rejection mailed 01/21/2004). Furthermore, with respect to Dr. Anderson's statement in said paragraph 12 of the Declaration that "the thickness-weighted average lattice constant of wells and barriers is roughly the same as the InP substrate", it is the Examiner position that if the lattice constants are 'roughly the same', then the period of barriers and quantum wells neighboring the substrate would exert substantially no strain on the substrate (see page 24, lines 3-7 of the Final Rejection mailed 01/21/2004).

3. *The "substantially no shear force" requirement is inherent in the device of Ekins-Daukes et al.*

Appellant notes the Examiner's position "that Ekins-Daukes et al's multiquantum well $GaAs_{0.939}P_{0.061}$ and $In_{0.17}Ga_{0.83}As$ on GaAs substrate inherently has zero-stress condition or substantially zero stress, and thus, there will be substantially no shear force as here claimed" and that "Ekins-Daukes et al's multiquantum well $GaAs_{0.939}P_{0.061}$ and

$In_{0.17}Ga_{0.83}As$ on GaAs substrate inherently has the claimed property of substantially no shear force on a neighboring structure."

Appellant argues that the issues of "inherency" have not been previously raised nor has the Examiner offered any evidentiary support for this claim. However, this argument is not deemed to be persuasive. Firstly, as noted above in the instant Supplemental Examiner's Answer, the Examiner has not raised a new issue. Rather, the Examiner has provided further rationale in support of the rejection based on Ekins-Daukes et al. For example, at page 3, lines 8-10, of the final rejection mailed 01/21/2004 the Examiner stated that "[s]ince the strain is zero over each period [i.e., the period of a compressively stained InGaAs quantum well/tensile strained GaAsP barrier], each period exhibits zero shear force on neighboring structures, which includes a further period or the substrate." In the Supplemental Examiner's Answer of 08/09/2005, the Examiner provides further rationale by showing that there is very little difference between the lattice constant for the GaAs substrate and for the actual InGaAs and GaAsP materials used by Ekins-Daukes et al, i.e., the lattice constants for the $In_{0.17}Ga_{0.83}As$ and $GaAs_{0.939}P_{0.061}$. Since there is very little difference in lattice constants, there is going to be "substantially no shear force" on neighboring structures, as here claimed. Furthermore, the Examiner has provided support for his position. In particular, as set forth in pages 3-4 of the Supplemental Reply Brief of 08/09/2005, "from instant Figure 7 it is seen that GaAs has a lattice constant of about 5.65 angstroms. The $GaAs_{0.939}P_{0.061}$ will be on the line between the GaP and GaAs data points in said Figure 7, and indeed, will be very close to but to the left of said GaAs data

point and on said line. Likewise, the $In_{0.17}Ga_{0.83}As$ will be on the line between the InAs and GaAs data points in said Figure 7, and indeed, will be close to but to the right of said GaAs data point and on the line between the InAs and GaAs. In other words, there will be very little difference between the lattice constants for the GaAs, $GaAs_{0.939}P_{0.061}$, and $In_{0.17}Ga_{0.83}As$. The same can be said for the strain compensated quantum well in instant Table I, where InP is the substrate, the barrier is $In_{0.45}Ga_{0.55}As$ and $In_{0.47}Ga_{0.53}As$, and the well is $In_{0.62}Ga_{0.38}As$. The $In_{0.45}Ga_{0.55}As$, $In_{0.47}Ga_{0.53}As$, and $In_{0.62}Ga_{0.38}As$ have lattice constants very close to the $In_{0.53}Ga_{0.47}As$ seen at the arrow in said Figure 7, and said $In_{0.53}Ga_{0.47}As$ has the same lattice constant as InP. Accordingly, it is the Examiner's position that Ekins-Daukes et al's multiquantum well $GaAs_{0.939}P_{0.061}$ and $In_{0.17}Ga_{0.83}As$ on GaAs substrate inherently has zero-stress condition or substantially zero stress, and thus, there will be substantially no shear force as here claimed. Indeed, according to the instant specification, in order for there to be no shear force, the equation for zero stress condition is $\epsilon_1 t_1 A_1 a_2 + \epsilon_2 t_2 A_2 a_1 = 0$, wherein $\epsilon_i = (a_0 - a_i)/a_i$ and a_0 is the lattice constant of the substrate and a_i is the natural unstrained lattice constant of layer i (see pages 11 and 12). For Ekins-Daukes et al's $GaAs_{0.939}P_{0.061}$ barrier and $In_{0.17}Ga_{0.83}As$ well with GaAs substrate, the lattice constant a_0 for the GaAs substrate is very close to the lattice constant a_1 and a_2 for the $GaAs_{0.939}P_{0.061}$ barrier and $In_{0.17}Ga_{0.83}As$ quantum well, and thus, ϵ_1 and ϵ_2 are very close to or essentially zero."

Appellant argues that the Examiner's positions of inherency "are incorrect in view of the evidentiary statements set out both in Appellant's specification (paragraph bridging pages 2-3) and in the Declaration of Dr. Anderson (who states in paragraph 12

that the teaching in Ekins-Daukes I [i.e., Ekins-Daukes et al], even though the thickness weighted average lattice constant of the wells and barriers is roughly the same as the substrate, 'this is insufficiently exact to ensure periods which exert 'substantially no shear force on an neighboring structure")". However, this argument is not deemed to be persuasive because the instant specification and the declaration of Dr. Anderson do not address the particular solar cell and materials used by Ekins-Daukes et al, i.e., the $GaAs_{0.939}P_{0.061}$ and $In_{0.17}Ga_{0.83}As$ on GaAs substrate. As noted in the sentence bridging pages 5 and 6 of the Supplemental Examiner's Answer (08/09/2005), said "paragraph 12 [of the Anderson Declaration] does not address the exact solar cell prepared in Ekins-Daukes et al, i.e., the multiquantum well $GaAs_{0.939}P_{0.061}$ and $In_{0.17}Ga_{0.83}As$ on GaAs substrate. Furthermore, as noted in paragraph 18 on page 24 of the final rejection mailed 01/21/2004, said "Declaration does not provide actual evidence regarding differences in structure; Dr. Anderson's statements, while respectfully considered, constitute allegations and opinions that do not distinguish the structure of the claimed device from the prior art."

Appellant argues that "[t]he Examiner appears to admit the lack of identicality in the lattice constants of the barriers and wells in the sentence bridging pages 3 and 4 (of the Supplemental Examiner's Answer), where he suggests that the lattice constant for GaAs substrate 'is very close to the lattice constant a_1 and a_2' for the barrier and the quantum well and thus are 'very close to or essentially zero.'" Appellant argues that "[t]he Examiner's unsupported allegations of inherency do not overcome Appellant's evidence contained both in the specification and in the Anderson Declaration which

confirm that the lattice constants for the barrier and well are not identical, and the strain-balancing method of EDI [Ekins-Daukes et al] is 'insufficiently exact,' and thus the EDI disclosure of zero strain does not suggest or teach 'substantially no shear force on a neighboring structure.'" However, this argument is not deemed to be persuasive because, once again, the instant specification and the declaration of Dr. Anderson do not address the particular solar cell and materials used by Ekins-Daukes et al, i.e., the $GaAs_{0.939}P_{0.061}$ and $In_{0.17}Ga_{0.83}As$ on GaAs substrate. Furthermore, as noted in paragraph 18 on page 24 of the final rejection mailed 01/21/2004, said "Declaration does not provide actual evidence regarding differences in structure; Dr. Anderson's statements, while respectfully considered, constitute allegations and opinions that do not distinguish the structure of the claimed device from the prior art." Furthermore, regarding the lattice constants for the $GaAs_{0.939}P_{0.061}$ and $In_{0.17}Ga_{0.83}As$ on GaAs substrate, the Examiner provides ample support for his position. In particular, from instant Figure 7 it is seen that GaAs has a lattice constant of about 5.65 angstroms. The $GaAs_{0.939}P_{0.061}$ will be on the line between the GaP and GaAs data points in said Figure 7, and indeed, will be very close to but to the left of said GaAs data point and on said line. Likewise, the $In_{0.17}Ga_{0.83}As$ will be on the line between the InAs and GaAs data points in said Figure 7, and indeed, will be close to but to the right of said GaAs data point and on the line between the InAs and GaAs. In other words, there will be very little difference between the lattice constants for the GaAs, $GaAs_{0.939}P_{0.061}$, and $In_{0.17}Ga_{0.83}As$. The same can be said for the strain compensated quantum well in instant Table I, where InP is the substrate, the barrier is $In_{0.45}Ga_{0.55}As$ and

$In_{0.47}Ga_{0.53}As$, and the well is $In_{0.62}Ga_{0.38}As$. The $In_{0.45}Ga_{0.55}As$, $In_{0.47}Ga_{0.53}As$, and $In_{0.62}Ga_{0.38}As$ have lattice constants very close to the $In_{0.53}Ga_{0.47}As$ seen at the arrow in said Figure 7, and said $In_{0.53}Ga_{0.47}As$ has the same lattice constant as InP. Accordingly, it is the Examiner's position that Ekins-Daukes et al's multiquantum well $GaAs_{0.939}P_{0.061}$ and $In_{0.17}Ga_{0.83}As$ on GaAs substrate inherently has zero-stress condition or substantially zero stress, and thus, there will be substantially no shear force as here claimed. Indeed, according to the instant specification, in order for there to be no shear force, the equation for zero stress condition is $\epsilon_1 t_1 A_1 a_2 + \epsilon_2 t_2 A_2 a_1 = 0$, wherein $\epsilon_i = (a_0 - a_i)/a_i$ and a_0 is the lattice constant of the substrate and a_i is the natural unstrained lattice constant of layer i (see pages 11 and 12). For Ekins-Daukes et al's $GaAs_{0.939}P_{0.061}$ barrier and $In_{0.17}Ga_{0.83}As$ well with GaAs substrate, the lattice constant a_0 for the GaAs substrate is very close to the lattice constant a_1 and a_2 for the $GaAs_{0.939}P_{0.061}$ barrier and $In_{0.17}Ga_{0.83}As$ quantum well, and thus, ϵ_1 and ϵ_2 are very close to or essentially zero.

4. *Response to Appellants position regarding Exhibit I.*

Appellant argues that the Supplemental Examiner's Answer raises a "straw man" argument that Exhibit I, attached to Appellant's Reply Brief is not exactly the same as Ekins-Daukes et al. Appellant argues that they never alleged that Exhibit I was a scale drawing or otherwise identical to Ekins-Daukes et al, but that it shows how in a MQW where lattice constants are different, there can still be a net stress which will cause efficiency robbing dislocations. Appellant argues that the present invention with different lattice constants can achieve a net zero or substantially zero stress and that the consequence of the zero net force is that MQW with much higher numbers of

periods than 20 can be created. However, this argument is not deemed to be persuasive because, in order to provide a fair comparison with the particular solar cell of Ekins-Daukes et al, the solar cell Ekins-Daukes et al should be used, not a hypothetical example. Neither hypothetical Exhibit I, nor, for that matter, the instant specification or the Declaration of Dr. Anderson, shows anything that would distinguish the structure of the claimed device from the prior art. With respect to using a higher number of periods than 20, Ekins-Daukes et al's device already has 20 quantum wells (QW) (see the paragraph bridging the first and second columns on page 4194). Ekins-Daukes et al further teaches that "[t]he stain-balanced cell QW absorption can be enhanced by adding additional QWs" (see the paragraph bridging pages 4196 and 4197).

5. *The Declaration of Dr. Anderson has been fully considered by the Examiner and is unpersuasive.*

Appellant cites paragraph 12 of the Anderson Declaration and argues that the Declarant has addressed exactly that which is disclosed in the Ekins-Daukes et al reference. Appellant argues that Dr. Anderson is an expert and that "[t]he Examiner has not questioned the veracity of Dr. Anderson's statement." However, Appellant's arguments are not deemed to be persuasive because the Examiner addressed the Anderson Declaration both in the Final Rejection mailed 01/21/2004 and in the Supplement Examiner's Answer of 08/09/2005. With regard to paragraph 12 of the Anderson Declaration, Appellant argued in the response dated 07/22/2003, in the second paragraph on page 24, that "Dr. Anderson testifies that the methods taught in Ekins-Daukes I [i.e., Ekins-Daukes et al] are 'insufficiently exact to ensure periods which

exert 'substantially no shear force on a neighboring structure'". In the Final Rejection dated 01/21/2004 (at pages 22-23), the Examiner does not deem this to be persuasive because Appellant is not claiming a method for making a photovoltaic device, they are claiming the photovoltaic device. While the method to produce the claimed photovoltaic device may be different than the method used by Ekins-Daukes et al, any difference is irrelevant because the instant claims are apparatus claims, and Ekins-Daukes et al teaches the same apparatus. "If ... [Appellant] believes the method used to fabricate the photovoltaic devices is an improvement over the methods used by Ekins-Daukes et al, as suggested by Dr. Anderson's allegation that the Ekins-Daukes I [i.e., Ekins-Daukes et al] method is 'insufficiently exact', then ... [Appellant] should consider the submission of method claims, as opposed to apparatus claims" (see page 23, lines 12-17 of said Final Rejection mailed 01/21/2004). Furthermore, a "reference that discloses a device having the same structure as the structure of the claimed device is not required to provide the same method of fabricating the device" (see page 23, lines 17-19 of the Final Rejection mailed 01/21/2004). Furthermore, with respect to Dr. Anderson's statement in said paragraph 12 of the Declaration that "the thickness-weighted average lattice constant of wells and barriers is roughly the same as the InP substrate", it is the Examiner position that if the lattice constants are 'roughly the same', then the period of barriers and quantum wells neighboring the substrate would exert substantially no strain on the substrate (see page 24, lines 3-7 of the Final Rejection mailed 01/21/2004). As set forth by the Examiner at lines 7-11 on page 24 of the Final Rejection mailed 01/21/2004, "[i]t is noted that the Declaration [of Dr. Anderson] does not provide

evidence regarding differences in structure; Dr. Anderson's statements, while respectfully considered, constitute allegations and opinions that do not distinguish the structure of the claimed device from the prior art." Additionally, as noted in the paragraph bridging pages 5 and 6 of the Supplement Examiner's Answer, said paragraph 12 of the Anderson Declaration does not address the exact solar cell prepared in Ekins-Daukes et al, i.e., the multiquantum well $GaAs_{0.939}P_{0.061}$ and $In_{0.17}Ga_{0.83}As$ on GaAs substrate. As noted above, in Ekins-Daukes et al's solar cell having $GaAs_{0.939}P_{0.061}$ barrier and $In_{0.17}Ga_{0.83}As$ well with GaAs substrate, the lattice constant a_0 for the GaAs substrate is very close to the lattice constant a_1 and a_2 for the $GaAs_{0.939}P_{0.061}$ barrier and $In_{0.17}Ga_{0.83}As$ quantum well, and thus, ϵ_1 and ϵ_2 in the equation for zero stress condition, $\epsilon_1 t_1 A_1 a_2 + \epsilon_2 t_2 A_2 a_1 = 0$, are very close to or essentially zero. Thus, it is the Examiner's position that Ekins-Daukes et al's multiquantum well $GaAs_{0.939}P_{0.061}$ and $In_{0.17}Ga_{0.83}As$ on GaAs substrate inherently has the claimed property of "substantially no shear force on a neighboring structure".

Summary

It is the Examiner's position that Ekins-Daukes et al's multiquantum well $GaAs_{0.939}P_{0.061}$ and $In_{0.17}Ga_{0.83}As$ on GaAs substrate inherently has zero-stress condition or substantially zero stress, and thus, there will be substantially no shear force as here claimed. This position is supported by the fact that from instant Figure 7 it is seen that GaAs has a lattice constant of about 5.65 angstroms. The $GaAs_{0.939}P_{0.061}$ will be on the line between the GaP and GaAs data points in said Figure 7, and indeed, will be very close to but to the left of said GaAs data point and on said line. Likewise, the

$In_{0.17}Ga_{0.83}As$ will be on the line between the InAs and GaAs data points in said Figure 7, and indeed, will be close to but to the right of said GaAs data point and on the line between the InAs and GaAs. In other words, there will be very little difference between the lattice constants for the GaAs, $GaAs_{0.939}P_{0.061}$, and $In_{0.17}Ga_{0.83}As$. The same can be said for the strain compensated quantum well in instant Table I, where InP is the substrate, the barrier is $In_{0.45}Ga_{0.55}As$ and $In_{0.47}Ga_{0.53}As$, and the well is $In_{0.62}Ga_{0.38}As$. The $In_{0.45}Ga_{0.55}As$, $In_{0.47}Ga_{0.53}As$, and $In_{0.62}Ga_{0.38}As$ have lattice constants very close to the $In_{0.53}Ga_{0.47}As$ seen at the arrow in said Figure 7, and said $In_{0.53}Ga_{0.47}As$ has the same lattice constant as InP. According to the instant specification, in order for there to be no shear force, the equation for zero stress condition is $\epsilon_1 t_1 A_1 a_2 + \epsilon_2 t_2 A_2 a_1 = 0$, wherein $\epsilon_i = (a_0 - a_i)/a_i$ and a_0 is the lattice constant of the substrate and a_i is the natural unstrained lattice constant of layer i (see pages 11 and 12). For Ekins-Daukes et al's $GaAs_{0.939}P_{0.061}$ barrier and $In_{0.17}Ga_{0.83}As$ well with GaAs substrate, the lattice constant a_0 for the GaAs substrate is very close to the lattice constant a_1 and a_2 for the $GaAs_{0.939}P_{0.061}$ barrier and $In_{0.17}Ga_{0.83}As$ quantum well, and thus, ϵ_1 and ϵ_2 are very close to or essentially zero.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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